

REMARKS/ARGUMENTS

Claims 1-7, 9-15, 17-19, and 25-29 are pending in the application. Claims 1, 4, 5, 9, 12, 13, 15, 18, and 19 are amended. Claims 8, 16, and 20-24 are canceled. Claims 25-29 are new. Support for the claim amendments and the new claims can be found in the claims as originally filed and in the specification on page 3, paragraph 14; page 4, paragraph 16; page 6, paragraph 20; page 6, paragraph 21; and on page 7, paragraph 23. No new matter is added.

Applicant has amended some claims and canceled others. Applicant does not concede that the subject matter encompassed by the earlier presented claims is not patentable over the art cited by the Examiner. Applicant canceled and amended claims in this response solely to facilitate expeditious prosecution of this application. Applicant traverses all rejections and respectfully reserves the right to pursue the earlier-presented claims, and additional claims, in one or more continuing applications.

I. 35 U.S.C. § 112, First Paragraph: Asserted Failure to Comply with the Written Description Requirement

I.A. Claim 1

The Examiner rejects claim 1 under 35 U.S.C. § 112, First Paragraph under the assertion that the term “consolidating” is not found in the specification. Without admitting whether this rejection is correct, Applicant deleted the rejected claim language. Thus, this portion of the rejection is overcome.

I.B. Claims 9 and 20

The Examiner rejects claims 9 and 20 under 35 U.S.C. § 112, First Paragraph under the assertion that the term “stacked solid layers” is not in the specification as originally filed. This rejection is respectfully traversed as being incorrect. Nevertheless, Applicant has removed the rejected claim language, thereby rendering the rejection moot.

However, Applicant points to page 2, paragraph 8, which indicates that that the powder blend is provided for forming metallic parts in a layer-by-layer technique. Inherently, a “layer-by-layer” technique creates stacked layers. Thus, the specification describes the previously claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the invention.

I.C. Claim 18

The Examiner rejects claim 18 under 35 U.S.C. § 112, First Paragraph under the assertion that “performing” is critical but not enabled and for the asserted lack of antecedent basis for the asserted original claim terms. Without admitting whether this rejection is correct, Applicant deleted the rejected

claim language and replaced the deleted language with language that closely follows the specification at page 6, paragraph 21 and on page 7, paragraph 23. Thus, this portion of the rejection is overcome.

II. 35 U.S.C. § 103: Asserted Obviousness

The Examiner rejects claims 1, 2, 9, 10, 17, 20, and 24 as obvious under 35 U.S.C. § 103 in view of *Lorenz, et al., Techniques for Infiltration of a Powder Metal Skeleton by a Similar Alloy With Melting Point Depressed*, U.S. Patent 6,719,948 (April 13, 2004) (hereinafter “*Lorenz*”) in view of *Feldstein, Methods for Alloy Migration Sintering*, U.S. Patent 5,248,475 (September 28, 1993) (hereinafter “*Feldstein*”). With respect to claims 20 and 24, this rejection is moot because these claims have been canceled. With respect to the remaining claims, this rejection is respectfully traversed.

Applicants first address the rejection of claim 1. In rejecting claim 1, the Examiner states that:

Lorenz et al teaches forming a skeleton or green part from powder metallurgy. Further processing includes using an infiltrant with a melting point depressant (MPD). The MPD diffuses into the skeleton, the liquid undergoes a diffusional solidification and the material eventually solidifies. Regarding melting the alloying metal, the infiltrant has a composition similar to that of the skeleton (column 2, lines 32-48 and column 3, lines 16-23). The powder metallurgy process to make the skeleton produces a homogeneous net shape (column 3, lines 4- 6). Titanium alloys can be used in this process (column 23, lines 45-50). The infiltrant is molten (column 3, line 29); the composition of the melt is established by, *inter alia*, separating the infiltrant from the melt prior to infiltration and adding excess skeleton material to the melt (lines 36-38). Regarding Claim 2, the alloying element with Ti includes Sn (column 23, line 52). However, Lorenz et al does not disclose the steps of spreading, directing and re-solidifying as in Claim 1.

Feldstein teaches a method for fabricating a sintered and solid element. The steps include, *inter alia*, coating discrete pieces of an "unsinterable" material with an alloying agent, exposing the discrete pieces to heat so that localized melting occurs to form molten surfaces on the discrete particles, and removing the heat away from the element (column 5, lines 1-46). The heat source is not specified in Feldstein, but the disclosed controlled heating reads on an energy beam. Titanium-based alloys can be used with alloying agents such as Sn and Ni (lines 55-58). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fabricating technique in Feldstein for the skeleton in Lorenz et al, since Feldstein teaches that the alloyed element concentration profile can be controlled, distribution is optimized, and costs of production are minimized (column 4, lines 11-18).

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The Examiner bears the burden of establishing a *prima facie* case of obviousness based on prior art when rejecting claims under 35 U.S.C. § 103. *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992). The prior art reference (or references when combined) must teach or suggest all the claim

limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). In determining obviousness, the scope and content of the prior art are... determined; differences between the prior art and the claims at issue are... ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or non-obviousness of the subject matter is determined. *Graham v. John Deere Co.*, 383 U.S. 1 (1966). “Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l. Co. v. Teleflex, Inc.*, No. 04-1350 (U.S. Apr. 30, 2007). “*Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.*” *Id.* (citing *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006)).”

Claim 1 as amended is as follows:

1. (Currently Amended) A method for selective sintering a powder, the method comprising:
 - spreading a layer of a powder blend on a platform, said powder blend comprising:
 - a base metal of titanium or alloy thereof, the base metal having a first melting temperature, and
 - an alloying metal having a second melting temperature lower than said first melting temperature,
 - wherein the base metal and alloying metal are selected, and quantitatively included in the powder blend, based on a characteristic of the base metal to dissolve in but not react with the alloying metal when the alloying metal is liquefied at an annealing temperature between the first and second melting temperatures, and wherein said powder blend does not include a carbon-based polymer;
 - directing an energy beam onto a localized portion of the layer of the powder blend and thereby melting said alloying metal in the localized portion;
 - and
 - re-solidifying said alloying metal by withdrawing said energy beam from said powder blend layer, and thereby binding said base metal or alloy thereof with said alloying metal in a metallic mixture in the localized portion, wherein a green part is formed;
 - thereafter brushing off excess powder from the green part;
 - heating the green part at a temperature sufficient to melt said alloying metal and dissolve the base metal therein to form a hyper-eutectic liquid composition; and
 - after the hyper-eutectic liquid composition is formed, cooling the hyper-eutectic liquid composition to form a sintered part.

II.A. The Examiner Failed to Address How the Combination Teaches the Claim Features

Generally, the Examiner did not address the features of the claims, except to say that *Lorenz* does not disclose the steps of spreading, directing, and re-solidifying. Rather, the Examiner simply pointed to two references directed to sintering and then described those references. However, the Examiner did not actually address how the references actually teach the claimed subject matter. For example, the Examiner did not address how *Feldstein* teaches the claimed steps of spreading, directing, and re-solidifying. In fact, as shown below, the proposed combination of *Feldstein* and *Lorenz* does not teach or suggest the originally presented claimed features of spreading and directing.

Additionally, the Examiner may not ignore features of the claims. *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994) (All limitations of the claimed invention must be considered when determining patentability.) In only describing references and then assuming that the references teach the required claim features, the Examiner effectively ignores claim features. For example, the Examiner explicitly ignores, by unsupported assumption, the previously presented feature of “directing an energy beam onto selected areas of the layer of the powder blend and thereby melting said alloying metal.” For this reason alone, the Examiner failed to state a *prima facie* obviousness rejection against previously presented claim 1. Additionally, the proposed combination does not teach or suggest all of the features of the claims.

II.B. The Proposed Combination, Considered as a Whole, Does Not Teach or Suggest All of the Features of Claim 1.

Additionally, no *prima facie* obviousness rejection can be stated against claim 1 as amended using a combination of *Feldstein* and *Lorenz* considered as a whole because the proposed combination does not teach or suggest all of the features of claim 1 as amended. Specifically, the combination of *Lorenz* and *Feldstein* does not teach or suggest, “spreading a layer of a powder blend on a platform,” “directing an energy beam onto a localized portion of the layer of the powder blend and thereby melting said alloying metal in the localized port,” and “thereafter brushing off excess powder from the green part.”

II.B.1. The Combination Does Not Teach or Suggest Spreading

The proposed combination of *Feldstein* and *Lorenz*, considered as a whole, does not teach or suggest “spreading a layer of a powder blend on a platform,” as in claim 1. Curiously, the Examiner admits that *Lorenz* does not teach this claimed feature, but then the Examiner then never asserts that *Feldstein* does teach this claimed feature. Thus, the Examiner appears to have assumed, inaccurately, that *Feldstein* teaches this feature.

Generally, *Feldstein* is directed to a method for sintering what was formerly considered unsinterable material. *Feldstein*, Abstract. The process of *Feldstein* is succinctly summarized by the following steps:

- (a) coating discrete pieces of the unsinterable material with a thin coating of the alloying agent;
- (b) packing the discrete pieces into a position--a bounded volume, or onto a backing and supporting structure, for example--where the coated grains are to be sintered so as to form the sintered and solid element being fabricated;
- (c) exposing the discrete pieces to a source of heat so that at least the coating and the regions of those discrete pieces just below the alloying agent coating on those discrete pieces is slowly raised in temperature towards a first temperature below which plastic deformation of the underlying unsinterable material will occur--its slump temperature--so that diffusion of the alloying agent into the discrete pieces of the unsinterable material will thereby occur and so as to thereby form diffusion regions at the interface of the coating and the unsinterable material, with a eutectic composition of the alloying agent and the unsinterable material occurring within the diffusion regions;
- (d) thereafter, further exposing the discrete pieces of unsinterable material to sufficient heat that at least the diffusion regions of those discrete pieces increase in temperature to a second temperature which is slightly above the eutectic melting point, whereby localized melting and thickening of the diffusion regions occurs so as to form molten surfaces on the discrete pieces that comprise substantially isothermal eutectic compositions, stabilized by the heat of fusion and thickened by further heat absorption, whereby adjacent grains begin to share the localized melting regions and become mutually wet;
- (e) maintaining the second temperature substantially constant, whereby the alloying agent continues to diffuse, thereby lowering the concentration of the alloying agent in the molten surfaces and raising the melting point thereof, so as to cause the molten surfaces to re-solidify, so that the wetted melted regions will freeze and adjacent discrete pieces of the unsinterable material will bond one to another, thereby achieving fabrication of a sintered and solid element of the unsinterable material; and
- (f) thereafter, removing the then fabricated sintered and solid element away from the heat, or removing the heat away from the sintered and solid element, so that the sintered and solid element is permitted to cool.

Feldstein, col. 5, ll. 1-49.

Of most importance to the claim feature at issue, in step (a) *Feldstein* coats discrete pieces of unsinterable material with a thin coating of an alloying agent. This teaching is completely different than, “spreading a layer of a powder blend on a platform,” as in claim 1. Whereas *Feldstein* coats discrete pieces, claim 1 spreads a layer of powder. On their face, the teaching of *Feldstein* is completely distinct from the requirements of claim 1.

Therefore, *Feldstein* does not teach or suggest the spreading feature of claim 1. The Examiner admits that *Lorenz* does not teach or suggest this claimed feature. Therefore, the proposed combination, considered as a whole, does not teach or suggest this claimed feature. Accordingly, under the standards of *In re Royka*, the Examiner failed to state a *prima facie* obviousness rejection against claim 1.

II.B.2. The Combination Does Not Teach or Suggest Directing an Energy Beam

Additionally, the proposed combination does not teach or suggest the claimed feature of “directing an energy beam onto a localized portion of the layer of the powder blend and thereby melting said alloying metal in the localized port,” as in claim 1. The Examiner assumes otherwise, stating:

The heat source is not specified in *Feldstein*, but the disclosed controlled heating reads on an energy beam.

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The Examiner has no basis to assume that controlled heating reads on an energy beam. In view of the fact that controlled heating in the art of sintering is usually performed using a furnace, welding torch, plasma spray, or similar non-beam heating mechanism, the Examiner’s assumption is actually unreasonable under the circumstances. Most importantly, neither reference actually teaches or suggests this claimed feature; therefore, under *In re Royka*, the Examiner failed to state a *prima facie* obviousness rejection against claim 1.

Additionally, neither *Lorenz* nor *Feldstein* teach or suggest the claimed feature of directing the energy beam onto a “*localized portion*” of the claimed powder layer, as not recited in amended claim 1. Thus, no *prima facie* obviousness rejection can be stated against claim 1 using a combination of the cited references.

II.B.3. The Combination Does Not Teach “Brushing”

Additionally, the combination does not teach or suggest the newly added claim feature of, “thereafter brushing off excess powder from the green part,” as in claim 1. This requirement of claim 1 simply is not taught or suggested in either reference. Therefore, no *prima facie* obviousness rejection can be stated against claim 1 using a combination of the cited references.

II.C. *Feldstein* Teaches Away from Claim 1

Additionally, the Examiner failed to state a *prima facie* obviousness rejection against claim 1 because *Feldstein* teaches away from claim 1. A reference may be said to “teach away” from the claimed invention when a person of ordinary skill, upon reading the reference, would be discouraged from

following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. *In re Gurley*, 27 F.3d 551, 553, 31 U.S.P.Q.2D 1130, 1131 (Fed. Cir. 1995).

In this case, *Feldstein* teaches coating only discrete portions of the part to be sintered. For example, *Feldstein* teaches, “(a) coating discrete pieces of the unsinterable material with a thin coating of the alloying agent.” *Feldstein*, col. 5, ll. 1-2 (emphasis supplied). Coating discrete pieces of material is manifestly contrary to spreading a powder, as claimed.

Thus, *Feldstein* would lead one of ordinary skill in a direction divergent from the path that was taken by claim 1. Accordingly, under *In re Gurley*, *Feldstein* teaches away from claim 1. Therefore, no *prima facie* obviousness rejection can be stated against claim 1 using a combination containing *Feldstein*.

II.D. The Examiner Failed To State a Proper Reason To Achieve the Legal Conclusion of Obviousness of Claim 1 under the Standards of *KSR Intl.*

The Examiner states that:

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the fabricating technique in *Feldstein* for the skeleton in *Lorenz et al*, since *Feldstein* teaches that the alloyed element concentration profile can be controlled, distribution is optimized, and costs of production are minimized (column 4, lines 11-18).

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The Examiner asserts that using the fabricating technique in *Feldstein* in *Lorenz* would be obvious. However, the Examiner does not state a rational underpinning to achieve the legal conclusion of obviousness with respect to claim 1. “Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *KSR Int’l. Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (April 30, 2007) (citing *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006)).”

In this case, the Examiner only provides a reason to combine *Feldstein* and *Lorenz*. The Examiner provides no reason to achieve the legal conclusion of obviousness of claim 1 in view of these references. The question of combining *Feldstein* and *Lorenz* is irrelevant. The question of whether claim 1 is obvious in view of the references considered as a whole is what is relevant.

In this case, no rational underpinning exists to achieve the legal conclusion that claim 1 is obvious in view of the references considered as a whole. *Lorenz* is directed to infiltration of a powder into a metal skeleton. *Feldstein* is directed to methods for sintering individual portions of unsinterable material. Given that *Feldstein* relies on coating discrete portions of a substance and *Lorenz* relies on infiltrating a three-dimensional structure, no reason can exist to assume that *Feldstein* and *Lorenz* can be technically combined in the first place.

Note that the Examiner relies on a purported advantage to combine *Feldstein* and *Lorenz*. However, the Examiner ignores the fact that *Feldstein* and *Lorenz* cannot be technically combined in the first place; therefore, the Examiner's asserted reason to combine the references is both incorrect and irrelevant.

In any case, the Examiner failed to state a proper reason to achieve the legal conclusion of obviousness of claim 1 under the standards of *KSR Intl.* Accordingly, the Examiner failed to state a *prima facie* obviousness rejection against claim 1.

II.E. Remaining Claims

The remaining claims in this rejection, 1, 2, 9, 10, and 17, all contain features similar to those presented in claim 1 as amended. Therefore, no *prima facie* obviousness rejection can be stated against the remaining claims at least for the reasons presented above.

II.F. Remaining Rejections

The Examiner rejects the remaining claims as obvious in view of *Lorenz*, *Feldstein*, and other references, such as *Rongti* (claims 3 and 11), the *CRC Handbook of Chemistry and Physics* (claims 4, 5, 7, 12, 13, and 15); *Clement* (claims 6, 7, 14, and 15). However, all of these claims contain features presented in claim 1, features that the proposed combination of *Lorenz* and *Feldstein* does not teach or suggest. Furthermore, *Rongti*, *Clement*, and the *CRC Handbook of Chemistry and Physics* do not teach or suggest the features missing from *Lorenz* and *Feldstein*. Therefore, all of the proposed combinations fail to teach or suggest all of the features of the claims. Accordingly, these rejections are all overcome.

III. Conclusion

The subject application is patentable over the cited references and should now be in condition for allowance. The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

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Respectfully submitted,

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